

WE CLAIM:

1 1. A method of fabricating an imaging device blooming control structure
2 comprising:

3 providing a semiconductor substrate in which is configured a photogenerated
4 electrical charge collection region;

5 forming a masking layer on the substrate;

6 providing an opening in the masking layer at a substrate location selected for a
7 blooming drain;

8 forming a blooming drain by implanting an impurity into the substrate at the
9 location of the masking layer opening; and

10 forming a blooming barrier region laterally adjacent to the blooming drain by
11 implanting an impurity into the substrate at a first acute angle with the substrate to
12 produce a lateral blooming barrier region width that corresponds to the first acute
13 implantation angle.

1 2. The method of claim 1 wherein the masking layer comprises photoresist.

1 3. The method of claim 1 wherein the step of providing an opening in the
2 masking layer comprises forming in the masking layer an opening having sidewalls
3 characterized by a non-vertical profile.

1 4. The method of claim 1 wherein the step of forming a masking layer
2 comprises forming at least two stacked masking layers each characterized by a distinct
3 impurity implantation stopping power.

1 5. The method of claim 4 wherein the step of providing an opening in the
2 masking layer comprises forming in each masking layer an opening having sidewalls of a
3 distinct, non-vertical profile.

13. The method of claim 1 wherein the first acute implantation angle is selected to produce a blooming barrier region width that exhibits a short-channel effect.

14. A method of fabricating an impurity region in a semiconductor substrate comprising:

forming a masking layer on the substrate;

forming a sidewall in the masking layer at a substrate location for the impurity region,

based on masking layer impurity implantation stopping power and masking layer sidewall profile, selecting an acute impurity implantation angle with the substrate that corresponds to a prespecified three-dimensional impurity region profile in the substrate; and

implanting an impurity into the substrate at the selected acute impurity implantation angle to produce the prespecified impurity region profile in the substrate.

15. The method of claim 14 wherein the step of forming a masking layer comprises forming at least two stacked masking layers each characterized by a distinct impurity implantation stopping power.

16. The method of claim 14 wherein the step of forming a sidewall in the masking layer comprises forming in each masking layer a sidewall of a distinct, non-vertical profile.

17. The method of claim 14 wherein the step of forming a sidewall in the masking layer comprises forming in each masking layer an opening of a distinct size.

18. The method of claim 14 wherein the step of forming a sidewall comprises forming a sidewall characterized by a non-vertical profile.

